INTEGRATED
Environmental Services, Inc.

Parcel D
Sampling and Analysis Plan

Boeing Realty Corporation
C-6 Facility
Los Angeles, California

May 1999

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Prepared by
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For
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SIGNATURES

PARCEL D SAMPLING AND ANALYSIS PLAN

BOEING REALTY CORPORATION C-6 FACILITY

LOS ANGELES, CALIFORNIA

MAY 1999

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1. INTRODUCTION

The Boeing Realty Corporation C-6 facility in Los Angeles, California, is currently undergoing a phased redevelopment. The facility (Figure 1-1) has been used in the manufacture, storage, and distribution of aircraft parts and components for over 45 years. Storage and distribution operations are active in the southeastern corner of the facility, but the northeastern and western portions of the property are being redeveloped for commercial use.

As shown in Figure 1-2, the site has been divided into four parcels. Redevelopment of the northeastern portion of the property, Parcel A, began in 1996 and is ongoing. BRC sold this parcel in December 1998. Redevelopment of the western portion, Parcel B, began in 1998 and is

FIGURE 1-1
C-6 FACILITY AND VICINITY

ongoing. Parcel C occupies the eastern portion of the property and will be redeveloped at a later date. However, because the southernmost portion of Parcel C has historically been used for parking and outdoor storage and the area will be available for redevelopment in early Summer 1999, this area has been divided into a separate parcel, and referred to as Parcel D.

Phase I environmental assessments have been conducted for all parcels comprising the C-6 facility (CDM 1991a, K/J 1996a, b, c), and Phase II soil investigations have been conducted for the two parcels currently undergoing redevelopment (CDM 1991b, K/J 1997 and 1998). It is important to note that for Parcels A and B, the environmental investigations and remediation of surface soils (top 12 feet) are complete. In April, 1998, a No Further Action certification for Parcel A was issued by the California Environmental Protection Agency (CAL/EPA), Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board (RWQCB). A certification for Parcel B is expected by June 1999.

As part of the cleanup and redevelopment effort, this Sampling and Analysis Plan (SAP) has been developed to characterize soil conditions and provide procedures for collecting and analyzing soil samples. Environmental samples will be collected and analyzed for constituents consistent with past and present site operations. Analytical results obtained from the sampling will be used to determine which areas (if any) contain constituents at levels requiring removal and/or treatment.

1.1 OBJECTIVES

The objectives of the Parcel D sampling and analysis program are to characterize the potential impacts to soil resulting from historical operations, support future remediation (if deemed necessary), and support the post-demolition risk assessment of potential health risks to future users of the redeveloped parcel. To accomplish these objectives, the following data quality objectives (DQOs) have been developed for this project:

- Identify and delineate potential source areas as they relate to former operations

- Develop sufficient data to support potential remediation
- Evaluate the horizontal extent and vertical depth of impacted soil (if any) to facilitate the post-demolition risk assessment

1.2 SITE DESCRIPTION AND GENERAL SITE HISTORY

The C-6 facility is located at 19503 South Normandie Avenue in Los Angeles, California, just south of the San Diego Freeway (I-405) and approximately 1 mile west of the Harbor (I-110) Freeway. The property is bordered by 190th Street to the north, Normandie Avenue to the east, 203rd Street to the south, and Western Avenue to the west (Figure 1-1). The 170-acre property has been divided into four parcels, A, B, C, and D, as shown in Figure 1-2. Parcel D, the subject of this report, forms the southeastern extent of C-6, and is bordered by industrial sites. Parcel B is directly west and Parcel C directly north of Parcel D. The Montrose Chemical property is adjacent to the south.

Aerial photographs indicate that C-6 and the surrounding area were farmland prior to the 1940s. During the early 1940s, the U.S. Defense Plant Corporation (PLANCOR) began industrial development of C-6 and the surrounding area as part of the war effort. An aluminum reduction plant was constructed on the site, and the Aluminum Company of America (ALCOA) operated the plant for the government until it closed in September 1944. Following the war, the War Assets Administration used the site for temporary storage for two years. In 1948, the Columbia Steel Company purchased the property but made no significant changes to the plant (CDM 1991a).

In March 1952, the U.S. Navy purchased the property and established the Douglas Aircraft Company (DAC) as the contractor and operator of the facility for the manufacture of aircraft parts. DAC purchased the property from the Navy in 1970 and used the facility to manufacture components for various commercial and military aircraft until approximately 1992. DAC has used the C-6 facility for the storage and distribution of aircraft parts since cessation of manufacturing activities (K/J 1996a, b, c).

McDonnell Douglas Realty Company (MDRC) began a phased cleanup and redevelopment of the C-6 facility 1996. In August 1997, Boeing Realty Corporation became the site operator responsible for cleanup, when its corporate parent, the Boeing Company, acquired McDonnell Douglas.

Parcels affected by each phase of the redevelopment undergo, as required, environmental investigation, assessment, and remediation prior to construction. To date, all structures in Parcels A and B have been razed or relocated, and soil remediation completed. The California Environmental Protection Agency (Cal/EPA), Department of Toxic Substances Control (DTSC) and Regional Water Quality Control Board (RWQCB), issued a No Further Action certification for Parcel A surface soils (0 to 12 feet bgs) in April 1998, and are expected to issue one for Parcel B by 1999.

1.3 Document Organization

This SAP has been organized into eight sections:

Section 1, ***Introduction***, presents the purpose and organization of the report, the operational history of C-6, and a description of Parcel D.

Section 2, ***Previous Investigations***, presents a summary of previous Parcel D investigations and their conclusions.

Section 3, ***Sample Location and Analysis***, discusses the sampling approach proposed for Parcel D, indicating where the soil samples will be collected and which analyses will be performed. Also described are the types of quality assurance/quality control (QA/QC) samples required to ensure the usefulness of the analytical results.

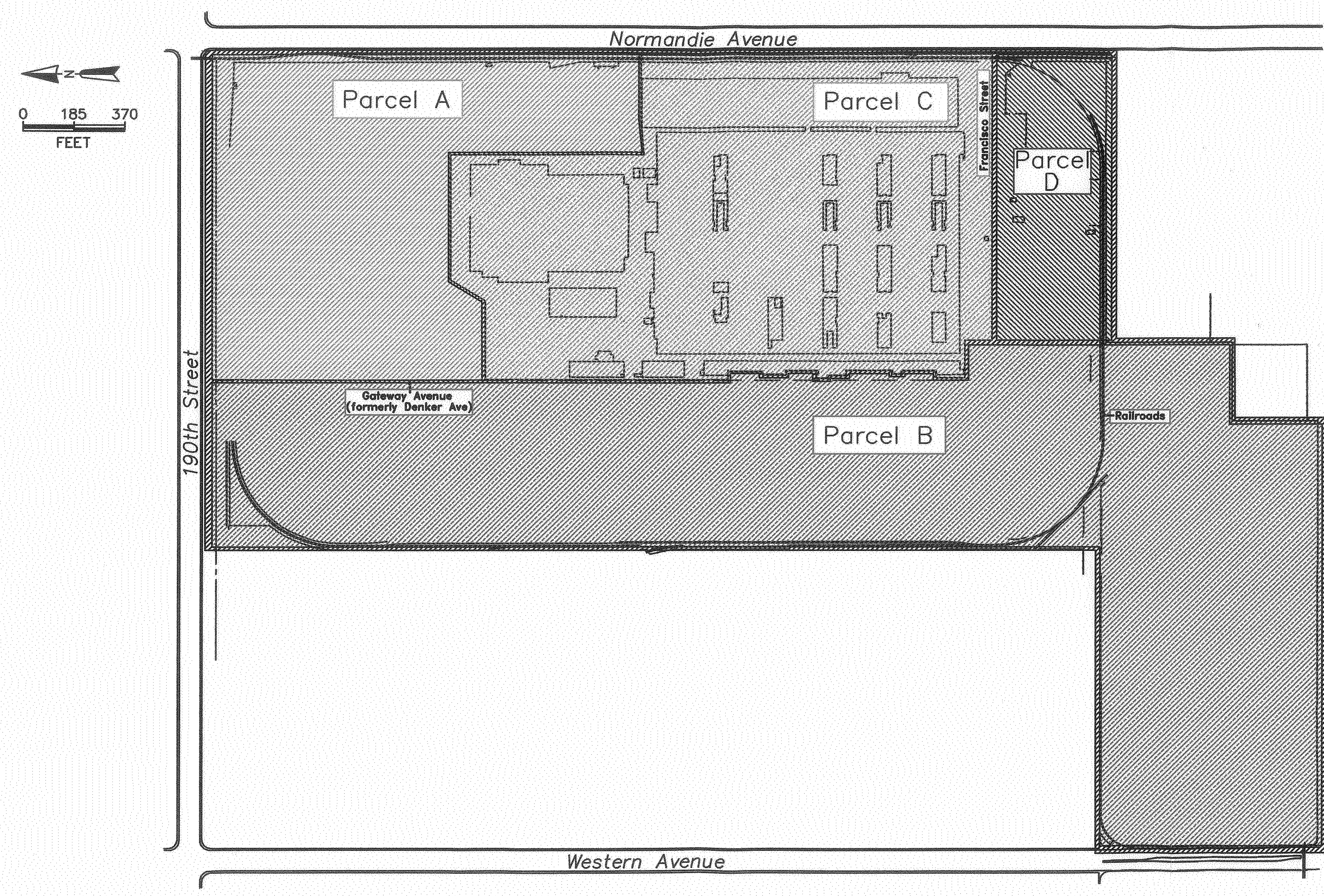
Section 4, ***Sample Identification and Designation***, presents the methods for identifying samples after collection.

Section 5, ***Sampling Equipment and Procedures***, describes the equipment that will be used to collect soil samples and provides the proper steps for calibrating field and laboratory instruments. Also described are the equipment decontamination procedures.

Section 6, ***Sample Handling and Analytical Procedures***, describes the procedures to be used in handling and preserving soil samples after collection. The types of containers required to store and ship samples to the laboratory are provided, as well as the field measurements and analytical methods required for sample analysis.

Section 7, ***Sample Handling and Custody***, describes the procedures to be followed when transferring custody of the soil samples from the site to the courier, and from the courier to the laboratory. In addition, the types of logs and field documentation required for the Parcel D SAP are discussed.

Section 8, ***References***, lists the literature cited in this plan.



INTEGRATED Environmental Services, Inc. 3380 Westerly Place, Suite 210 Newport Beach, CA 92660 (949) 852-9050	TITLE: Parcel Delineation Boeing C-6 Facility Los Angeles, CA	DWN: JDL DES.: JDL CHKD: JPO APPR: JSB DATE: 4/23/99 REV.: 1	PROJECT NO.: BOC6/PARD FIGURE NO.: 1-2

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2. SUMMARY OF ENVIRONMENTAL INVESTIGATIONS

Since the mid-1980s, the Boeing C-6 facility has been the subject of various environmental investigations, most of which have focused on specific areas of the site. To date, the most comprehensive site-wide study of the C-6 facility is documented in the Phase I Environmental Assessments of Parcels A, B, and C conducted by Kennedy/Jenks Consultants in 1996. Soil investigations have been conducted for Parcels A and B as a follow-up to the findings of the Phase I, but no comprehensive characterization of soils has occurred in Parcel C or the new Parcel D. A summary of the findings, as they pertain to the new Parcel D area, is provided below.

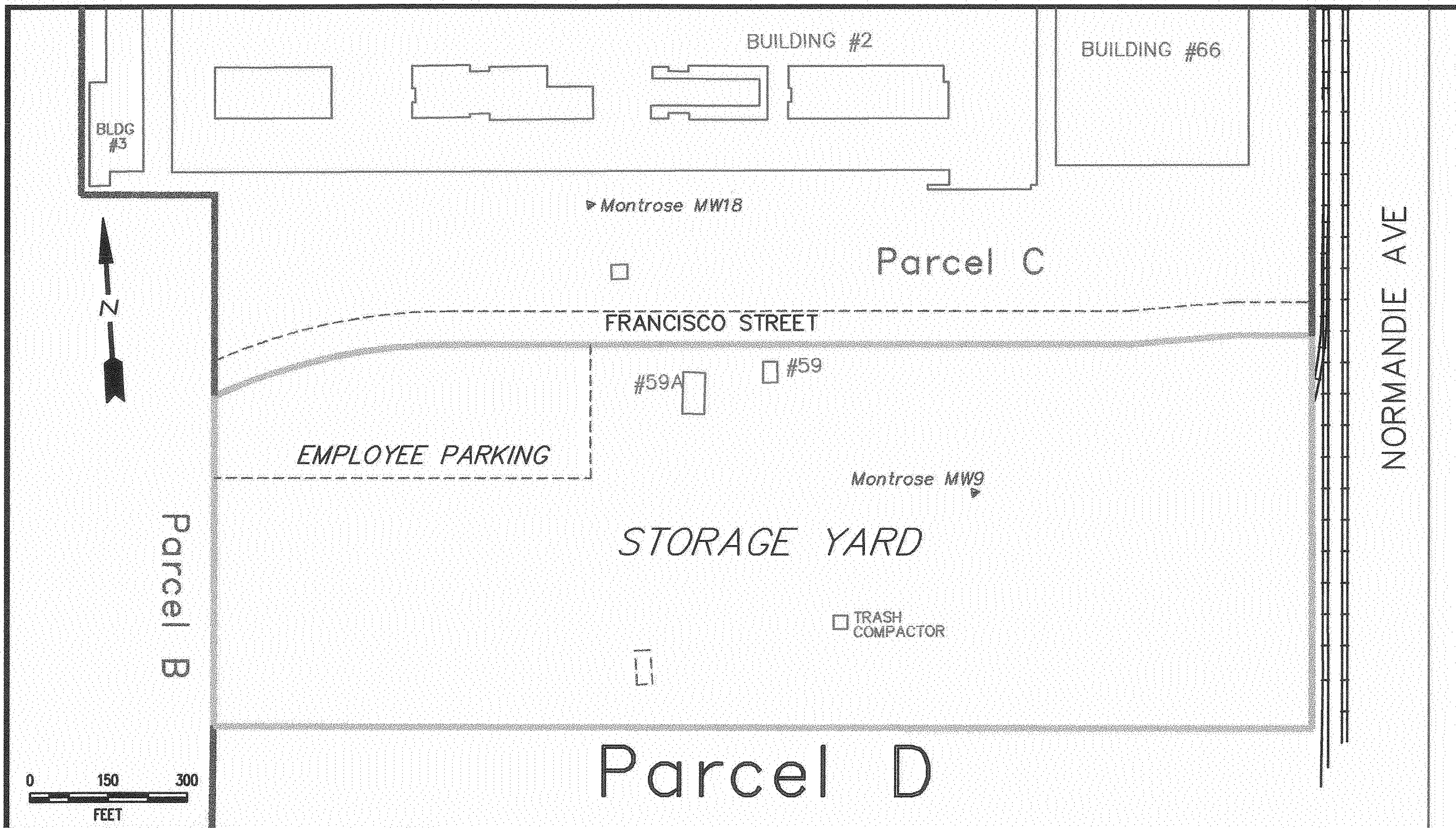
As mentioned, only a Phase I investigation of Parcel C has been conducted by Kennedy/Jenks in 1996. Areas within the parcel believed to be of "environmental interest" were identified for further sampling and analysis to determine the presence or absence of contamination. These areas are described below and presented in Figure 2-1.

Buildings 59 and 59A

Building 59 serves as the support office for the truck weighing station. A spring-mounted truck scale is located immediately north of the building. The scale readout and office equipment are inside the building. This building is constructed of corrugated metal sheets with concrete flooring. The truck scale is elevated approximately 2 inches and the building floor approximately 5 inches above the ground. The concrete surrounding the scale appears in good condition with no obvious cracks or weathering. No items of concern were identified in and around Building 59 (IESI 1999a).

Since 1997, Building 59A has been used to store hazardous waste such as asbestos piping, waste solvents, old paint, and fluorescent lamps. Prior to 1997, the building was used as an equipment maintenance garage. Like Building 59, this building is constructed of corrugated metal sheets with concrete flooring. Building 59A remains locked at all times. The storage containers are well

Parcel-Acres.dwg



INTEGRATED Environmental Services, Inc. 3990 Westerly Place, Suite 210 Newport Beach, CA 92660 (949) 852-9050	TITLE: Parcel D Boeing C-6 Facility Los Angeles, CA	DWN: JDL	DES.: JDL	PROJECT NO.: BOC6\PDSAP
		CHK: GY	APPD: JPO	FIGURE NO.: 2-1
		DATE: 04/29/99	REV.: 2	

maintained and exhibit proper labeling. The concrete flooring is also in good condition with no visible signs of cracks or weathering. A concrete berm surrounds the building (IESI 1999a).

Storage Yard

The storage yard is covered with asphalt paving and has been used to store miscellaneous materials and equipment such as airplane parts, steel beams and pipes, cement parking pylons, cinder blocks, and tires. A light tower (with transformer) and a water tank stand in the center of the yard, and a trash compactor is in the southern portion of the yard. The trash compactor sits on a concrete pad, which is raised approximately 1 inch above the ground, and is surrounded by a concrete berm on three sides and an access ramp on one side. Oil staining is visible on the compactor and the concrete pad. No staining was observed in the ramp area. The concrete pad appears to be in good condition (IESI 1999b).

An asphalt-paved parking lot is immediately north of the storage yard. This parking lot has been used for employee parking since the 1940s.

3. SAMPLE LOCATIONS AND ANALYSES

3.1 SAMPLE LOCATIONS

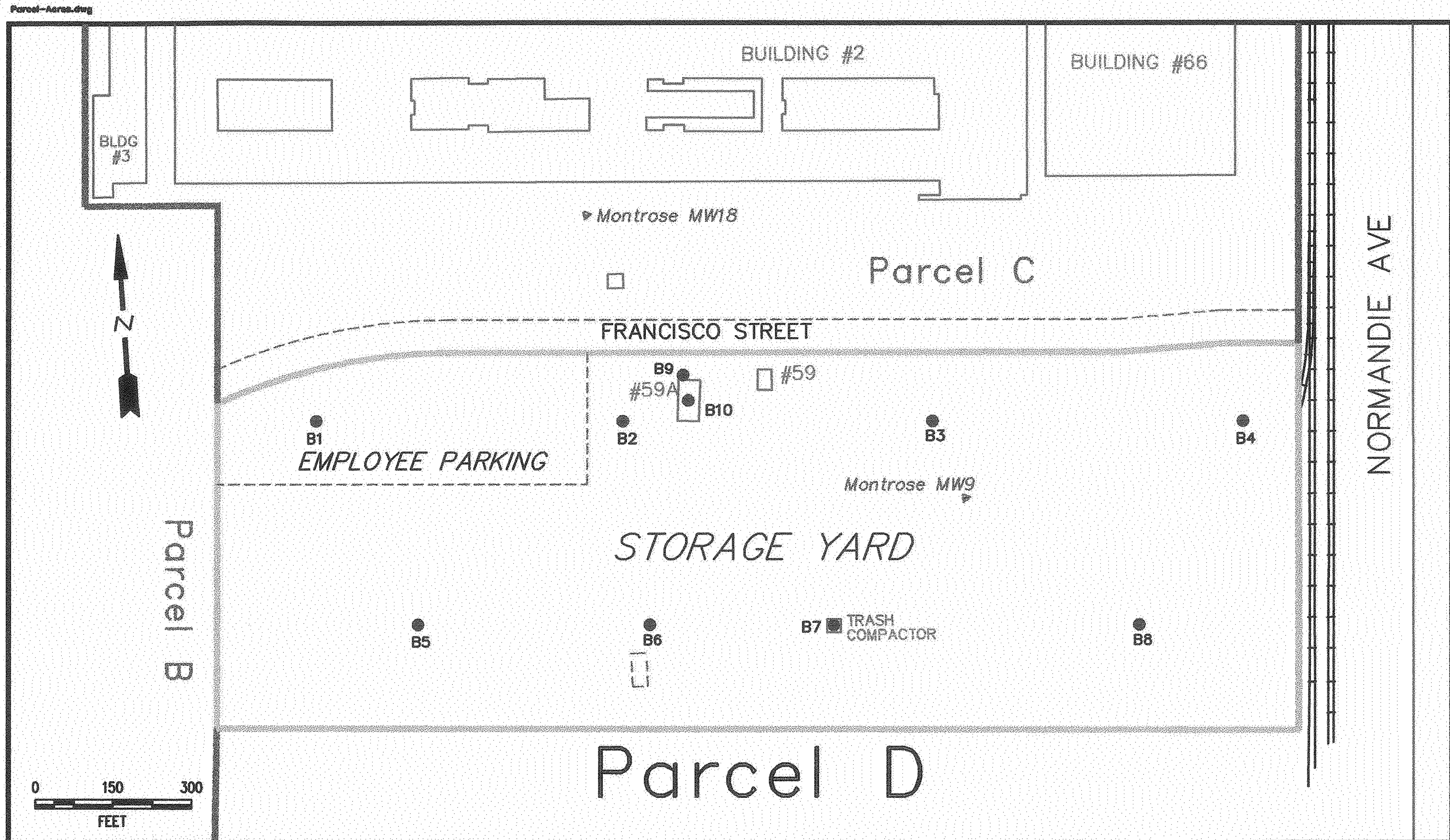
Soil samples will be collected from predetermined locations within Parcel D, based on past or present operations, and the samples will be analyzed for constituents of environmental interest related to those operations. The analytical data collected will be used to meet the objectives specified in Section 1.

The areas identified for potential environmental concern in Parcel D include Building 59A and the Storage Yard. The soil boring locations proposed at these areas and the sampling rationale are presented below.

3.1.1 Building 59A

Building 59A, which is directly south-southwest of Parcel D, was used as a maintenance facility before being converted to a hazardous-waste storage facility. According to a 1986 drawing, a 1,000-gallon "drainage tank" was located directly northwest of this building. The drawing did not indicate the tank's contents or whether it was above or below ground. No other historical activities of concern have been identified at Building 59A.

Based on the historical and current usage of the building, soil samples will be collected to assess any potential impacts (Figure 3-1). In Building 59A, one boring will be advanced outside the northwest corner and one inside the building; samples will be analyzed for volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH), polychlorinated biphenyls (PCBs), and metals. Details concerning soil sampling are presented in Section 3.2.



INTEGRATED Environmental Services, Inc. 3990 Westerly Place, Suite 210 Newport Beach, CA 92660 (949) 852-9050	TITLE: Parcel D Soil Sampling Locations Boeing C-6 Facility Los Angeles, CA	DWN: JDL	DES.: JDL	PROJECT NO.: BOC6\PDSAP
		CHK: GY	APPD: JPO	FIGURE NO.: 3-1
		DATE: 04/29/99	REV.: 2	

3.1.2 Storage Yard

The storage yard currently houses airplane parts, scrap metal, several empty storage bins, a water tank, a light tower with transformer, and a trash compactor. The transformer has a blue label indicating it has been tested and certified as not containing PCBs.

Due to the historical storage of miscellaneous equipment and materials, eight soil borings will be advanced throughout the storage yard to assess any potential impacts from current or historical activities (Figure 3-1). One of the eight borings (B7) will be advanced at the location of the trash compactor. Soil samples will be analyzed for VOCs, SVOCs, TPH, and metals. Details concerning soil sampling are presented in Section 3.2.

3.2 SOIL SAMPLING AND ANALYSIS

Soil samples will be collected at the locations described in Section 3.1 to evaluate whether operations-related constituents are present in those areas. Samples will be collected from borings at specific locations and depths as discussed below. Borings will not be advanced to depths greater than 25 feet bgs. The depth to groundwater at the site is approximately 65 feet bgs and therefore will not be impacted by the soil boring activities.

Since most of the parcel has historically been used for storage and employee parking, a staggered sampling approach will be used so that soil sample locations will be representative of site uses. As shown in Figure 3-1, the sampling approach consists of placing two staggered rows of borings spaced approximately 200 feet a part, with the individual borings spaced approximately 300 feet a part. Sample results will be compared to the Health-Based Remediation Goals (HBRGs) for surface soils (IESI 1997) to determine whether soils have been impacted by past operations.

It is important to note that the HBRG values have not been approved by DTSC as site cleanup goals and are used only for internal, soil-screening purposes. The use of these values does not guarantee DTSC approval of soil closure and are used at Boeing's own risk. It is understood by all parties that the findings of a parcel-specific, post-demolition risk assessment will establish whether Parcel D requires further remediation. The HBRGs are presented in Appendix A.

The following provides the details for the sampling and analysis of Parcel D. The details discussed include the sample location, number of borings, number of samples and sampling depth, and required laboratory analyses.

3.2.1 Building 59A

Before soil borings are advanced in Building 59, the structure and foundation will be removed. The sampling approach involves advancing two borings to a depth of 15 feet bgs and collecting soil samples at depths of 6 inches and 5, 10, and 15 feet. Eight soil samples will be submitted to the laboratory and analyzed for the VOCs, SVOCs, TPH, PCBs, and metals. One boring will be advanced at the location of the former tank and one in the center of the waste storage area.

Table 3-1 presents sampling and chemical analyses to be conducted at each building, while Figure 3-1 presents the proposed sampling locations.

3.2.2 Storage Yard

The sampling approach for the storage yard involves advancing eight borings to a depth of 25 feet bgs and collecting soil samples at depths of 6 inches and 5, 10, 15, and 25 feet. Forty soil samples will be submitted to the laboratory, however, only those samples collected between 6 inches and 15 feet bgs, and three samples collected at 25 feet bgs (from borings B1, B4, and B7), will be analyzed for VOCs, SVOCs, TPH, pesticides, and metals. The remaining five samples collected at 25 feet bgs (B2, B3, B5, B6, and B8) will be placed on hold at the laboratory and analyzed only if concentrations detected in the associated 15-foot sample exceed the HBRGs.

TABLE 3-1
SOIL SAMPLING SUMMARY

Location	No. Borings	No. Sample Locations and Depths	No. Samples Analyzed	Chemicals Analyzed
Building 59A	2	8 at 6 in, 5, 10, & 15 ft	8	VOCs, SVOCs, TPH, PCBs, metals
Storage Yard	8	40 at 6 in, 5, 10, 15, & 25 ft	35*	VOCs, SVOCs, TPH, pesticides, metals

Note:
*Five soils samples collected at 25 feet bgs at borings B2, B3, B5, B6, and B8 will be submitted to the laboratory and placed on hold. These samples will be analyzed only if concentrations detected in the associated 15-foot sample exceed the HBRGs.

Table 3-1 presents sampling and chemical analyses to be conducted at each building, while Figure 3-1 presents the proposed sampling locations.

Although there is no pesticide use in the history of operations at the C-6 facility, pesticides were manufactured at the Montrose Chemical facility located directly south of Parcel D. Therefore, the potential impacts of pesticides on the C-6 facility will be assessed.

3.3 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Standard laboratory quality assurance/quality control (QA/QC) procedures will be followed to ensure the quality of the analytical results obtained from all soil samples. In addition, four types of field QA/QC samples will be collected and analyzed:

- Trip blanks
- Field blanks
- Equipment rinsates
- Field duplicates

Collection and analyses of trip blanks, field blanks, equipment rinsates, and field duplicates are intended as QA/QC checks on the representativeness of the samples collected, the precision of sample collection and handling procedures, and the thoroughness of the field equipment decontamination procedures between sampling events. A sampling event is considered to start when the sampling personnel arrive at the site and end when these personnel leave for more than one week.

Trip Blanks

Trip blanks are samples that originate at the laboratory, are transported to the sampling site, and are returned to the laboratory with those site samples to be analyzed for VOCs. Trip blanks will be placed in sample coolers before being taken to the site, so they will accompany the samples throughout the sample collection, handling, and transport process. The results of the trip blank analyses are used to determine whether site samples have been contaminated by VOCs during sample handling or transport.

Field Blanks

Field blank samples will be collected from each water source (e.g., distilled water, steam cleaning water) used to decontaminated field equipment. Field blanks will be analyzed for the same parameters as will the samples collected when the water sources are being used for decontamination. The results of the field blanks will be used to assess whether wash or rinse water contained contaminants that may have been carried over into the site samples.

Equipment Rinsates

The equipment rinsate samples will be collected by pouring analyte-free water over and through the sample collection equipment after the equipment's final decontamination rinse. The samples will be analyzed for the same parameters as will the samples collected using a particular sampling method (e.g., split spoon or hand auger). The results of the equipment rinsate are used to determine whether equipment decontamination was effective.

Field Duplicates

Field duplicate samples will be collected from adjacent liner (stainless-steel sleeve) locations. The duplicate samples will be analyzed for the same parameters as will their associated original samples. The results of the field duplicate samples are used to evaluate the entire sample measurement system.

Trip blanks, field blanks, and equipment rinsates are prepared using analyte-free water and sample containers. All blanks will be handled and analyzed in the same manner as samples collected from the site. Sample numbers for the blanks shall be sequential with the samples collected (see Section 4). The field QA/QC samples will be collected as follows:

- One trip blank will be prepared per cooler per sampling team for VOC samples.
- One field blank will be collected per decontamination water source per event. The blank will be analyzed for the same parameters as will the associated investigative sample.
- Equipment rinsates will be collected for each soil sampling method. The rinsate will be analyzed for the same parameters as will the associated investigative sample. One equipment blank will be taken for each soil sample collection method (e.g., hand trowels, split-spoon samplers) per event.
- One field duplicate sample will be collected for every 20 soil samples. Field duplicates will be collected from adjacent liners in the split spoon. The duplicate will be analyzed for the same parameters as will the associated investigative sample.

Table 3-2 presents the number of QA/QC samples to be collected during this sampling effort.

TABLE 3-2
QA/QC SAMPLES

Sample Type	No. of Samples	Chemical Analysis
Trip Blanks	1	VOCs
Field Blanks[(a)]	1	VOCs, SVOCs, TPH, PCBs, metals
Equipment Rinsates[(b)]	1	VOCs, SVOCs, TPH, PCBs, metals
Field Duplicates[(c)]	2	VOCs, SVOCs, TPH, metals

Notes:
(a) One field blank will be collected from the decontamination water source per sampling event.
(b) One equipment rinsate will be collected for the sample collection method (split spoon).
(c) Field duplicate samples and their associated investigative samples will be analyzed for the same analytical parameters. Analytical parameters for each AOPC are presented in Table 3-1.

3.4 UTILITY SURVEY

Before any sampling or other intrusive activities have begun, a utility location survey will be conducted to identify subsurface structures that may impede boring at the proposed sampling locations. The results of the survey will be used to modify the proposed sampling locations, if necessary.

3.5 LAND SURVEY

The soil sampling locations will be surveyed by a registered land surveyor using horizontal accuracies of ±0.1 feet. The surveyor will generate a scaled base map of the site showing the locations of all surveyed features.

3.6 MANAGEMENT OF INVESTIGATION-DERIVED WASTE

Investigation-derived waste (IDW) will consist of soil cuttings, decontamination water, and discarded personal protective equipment (PPE). Following completion of the field activities, disposal options will be recommended based on the findings of the investigation. Table 3-3 summarizes the type and quantity of the IDW anticipated during implementation of the above-mentioned.

TABLE 3-3
ANTICIPATED IDW FOR PARCEL D

IDW Type	Estimated Quantity (55-gallon drums)
Soil Cuttings	1[a]
PPE/Visqueen	1 (5 gal.)[b]
Decontamination Rinse Water	1[c]

Notes:
(a) Estimated assuming that one 55-gallon drum will be required to contain soil cuttings from the ten soil borings advanced using a direct-push drilling technique.
(b) Estimated assuming that one 5-gallon bucket will be required to contain discarded PPE and visqueen for the duration of field sampling (assuming 1 to 2 days of field sampling).
(c) Estimated assuming that one 55-gallon drums will be required to contain decontamination rinse water for the duration of field sampling (assuming 1 to 2 days of field sampling).

4. SAMPLE IDENTIFICATION AND DESIGNATION

All samples collected in Parcel D will be assigned a unique identification number. This identification number will be used on all documentation relating to the collection, handling, analysis, and reporting of the analytical results of each sample. Since a sample is normally analyzed for several different chemical constituents or parameters, each requiring different sample containers and preservation techniques, the same sample identification number will be assigned to each portion of the original sample split among the containers. The method of identification of a sample will depend on the type of measurement taken or analysis performed.

Samples will be numbered in consecutive order as they are collected. Duplicate samples will be assigned the same number as the original appended with a "D." The following template will be used:

ParD-Bx-y-z

where

ParD	=	Parcel D
Bx	=	boring identification (e.g., B1)
y	=	sample number for boring identification (sequentially numbered samples collected from each boring, e.g., 1, 2, 3)
z	=	sample depth (expressed in feet below ground surface)

For example, the second soil sample collected from the fourth soil boring at a depth of 5.5 feet bgs in Parcel D would be designated ParD-B4-2-5.5. The first sample from the same boring at a depth of 1.5 feet bgs would be designated ParD-B4-1-1.5.

QC samples will be designated as follows and numbered sequentially:

- Trip Blank-#

- Field Blank-#
- Rinsate-#

Labels provided by the laboratory will be affixed to each sample collected. Each will contain the following information:

- Project name and location
- Project number
- Sample identification number
- Date and time of collection
- Name or initials of sampler
- Analyses to be performed

5. SAMPLING PROCEDURES AND EQUIPMENT

5.1 SOIL SAMPLING PROCEDURES

Soil samples will be collected using a direct-push drilling technique, which uses a truck-mounted, hydraulically driven sampler that allows uniform penetration and sampling. This technique also minimizes the generation of drill cuttings. Soil samples will be collected using 6-inch stainless-steel sleeves. At the completion of the sampling, the boreholes will be backfilled with a cement-bentonite grout. To minimize cross contamination, the sampling equipment will be decontaminated prior to each use (see Section 5.2).

Section 3 of this SAP discusses the proposed number and locations of soil samples to be collected. The actual number and locations will be determined based on field observations and field screening results obtained from soil cuttings. Soil cuttings will be screened using a photoionization detector (PID) to evaluate whether a potential source is present. Results of the screening will be recorded on the field forms.

5.2 EQUIPMENT DECONTAMINATION PROCEDURES

All material and equipment that come into contact with potentially contaminated soil, drilling fluid, or water will be decontaminated prior to and after each use. This will prevent or minimize cross contamination in samples and sampled media, which is important for preventing the introduction of error into the sampling results and for protecting the health and safety of site personnel. Decontamination will consist of a nonphosphate detergent scrub, followed by fresh-water and distilled-water rinses. After the material and equipment are decontaminated, they will be stored on clean plastic sheeting in an uncontaminated area. The following decontamination procedures will be used for sampling material and equipment:

- Direct-push drill rods and equipment placed in the hole during drilling will be decontaminated prior to use and between borings. Visible soil and grease will be removed with a stiff brush prior to the nonphosphate detergent scrub.

- Soil samplers (i.e., split spoons) will be cleaned prior to their initial use and between uses, as follows:

  - Nonphosphate detergent wash
  - Tap-water rinse
  - Distilled-water rinse (two to three times)

5.3 CALIBRATION PROCEDURES

Calibration is the process of adjusting an instrument's response to match that of a known reference standard. These procedures ensure the operator that the instrument is operating properly and will generate reliable data.

The procedures described below pertain to the calibration of equipment and instrumentation in the field and laboratory. The procedures reference standard operating procedures (SOPs) when available and specify calibration frequency and standards. All calibrations for field and laboratory equipment will be recorded in appropriate field notebooks.

5.3.1 Field Instrument Calibration

Devices shall be calibrated and adjusted at specified, predetermined intervals using appropriate material and equipment (e.g., calibrated gases). All equipment will be checked daily and recalibrated when the difference between the reference standard and instrument readout exceeds 10 percent (plus or minus), or a smaller percentage if suggested by the manufacturer. Instruments will be recalibrated anytime they are subjected to conditions outside the range of normal use or anytime field personnel suspect the calibration may have been altered. Instruments will be recalibrated prior to use after they have been subjected to a sudden impact from being dropped or mishandled, or after significant changes in temperature or humidity, or when their batteries have been depleted. The user is responsible for operating and calibrating equipment in the proper manner.

The following are implemented for field-calibrated equipment:

- A list will be established of the instruments to be calibrated and the frequency of calibration for each. The method and interval of calibration shall be based on the instrument's stability characteristics, required accuracy, and other conditions affecting measurement control.

- The range, type, and accuracy of the instruments in use will be appropriate for the tests being performed.

- A master calibration file will be maintained for each instrument and will include, at a minimum, the following information:

  - Name of instrument/model number
  - Serial and/or identification number
  - Frequency of calibration
  - Date of last calibration
  - Name of party performing last calibration
  - Due date for next calibration
  - Identification of the calibration gas or solution

- Instruments will be marked with calibration due dates whenever possible. When this is not possible, alternative methods of tracing the device to its calibration date shall be employed.

The only field instrument planned for use during the Parcel C soil sampling program is the PID, which will be calibrated against 100 ppm of isobutylene (zero air).

5.3.2 Laboratory Instrument Calibration

The laboratory instruments used to analyze the samples will be calibrated according to, and at the frequency indicated by, the specific analytical methods used. All instruments will be calibrated through the use of standard solutions of known concentrations. Standards will be prepared from certified reference solutions obtained from approved chemical vendors.

As stated above, the instruments will be calibrated at a frequency defined by the specific analytical methods used, but the calibration will be continuously verified by analysis of calibration standards or comparison to laboratory control samples at regular intervals. Calibration will be performed at specified intervals, as determined by the performance of the instrument in the field.

6. SAMPLE HANDLING AND ANALYTICAL PROCEDURES

All samples will be handled according to the procedures described or cited in this section. The containers and preservation measures to be used are specified in Section 6.1. Analytical procedures are presented in Section 6.2. Field logs and sample custody forms will also be maintained, and all samples will be labeled as specified in Section 7.

6.1 SAMPLE CONTAINERS AND PRESERVATION MEASURES

The use of proper sample containers is important to ensure that the analytical data collected truly represent site conditions, that the sample volumes are sufficient for analysis, and that the potential for the container itself to contaminate the samples is negligible.

Stainless-steel liners will be supplied by the drilling subcontractor. Prior to sample collection, the liners will be cleaned in accordance with the decontamination procedures described in Section 5.2. Other clean sample containers will be supplied by the laboratory. The containers shall remain in their storage packaging during transport to the sampling location, until they are needed, to avoid the potential introduction of contaminants.

Sample preservation measures will be instituted to prevent or retard the degradation or modification of chemicals and to retard biological activity in samples during transit and storage. Efforts to preserve the integrity of the samples will be initiated at the time of the sampling and will continue until the analyses are performed.

Table 6-1 presents the sample containers, preservation measures, and holding times specified under the respective analytical method for each parameter.

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All samples will be handled according to the procedures described or cited in this section. The containers and preservation measures to be used are specified in Section 6.1. Analytical procedures are presented in Section 6.2. Field logs and sample custody forms will also be maintained, and all samples will be labeled as specified in Section 7.

6.1 SAMPLE CONTAINERS AND PRESERVATION MEASURES

The use of proper sample containers is important to ensure that the analytical data collected truly represent site conditions, that the sample volumes are sufficient for analysis, and that the potential for the container itself to contaminate the samples is negligible.

Stainless-steel liners will be supplied by the drilling subcontractor. Prior to sample collection, the liners will be cleaned in accordance with the decontamination procedures described in Section 5.2. Other clean sample containers will be supplied by the laboratory. The containers shall remain in their storage packaging during transport to the sampling location, until they are needed, to avoid the potential introduction of contaminants.

Sample preservation measures will be instituted to prevent or retard the degradation or modification of chemicals and to retard biological activity in samples during transit and storage. Efforts to preserve the integrity of the samples will be initiated at the time of the sampling and will continue until the analyses are performed.

Table 6-1 presents the sample containers, preservation measures, and holding times specified under the respective analytical method for each parameter.

TABLE 6-1
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Parameter	EPA Analytical Method	Matrix[a]	Container[b]	Sample Volume	Preservation Measure	Holding Time[c]
VOCs	8260	soil	Stainless steel liner or glass jar	4 oz	Cool, 4°C	14 days
		water	Borosilicate glass 40-ml vial with teflon-lined septum [d]	40 ml in duplicate	Cool, 4°C HCL to pH <2 Cool container to 4°C prior to sampling. Store in dark.	14 days
SVOCs	8270	soil	Stainless steel liner or glass jar	4 oz	Cool, 4°C	14 days until extraction; 40 days after extraction
		water	Amber glass with teflon-lined cap	1 liter	Cool, 4°C Cool container to 4°C prior to sampling. Store in dark.	7 days until extraction; 40 days after extraction
Title 22 Metals[e]	6010	soil	Stainless steel liners or glass jars	8 oz	Cool, 4°C	6 months
		water	Polyethylene or glass bottle	100 ml	HNO_3 to pH <2	6 months
Chromium (VI)	7196	soil	Stainless steel liners or glass jars	4 oz	Cool, 4°C	6 months
		water	Polyethylene or glass bottle	100 ml	No preservatives for Cr^{+6} analysis.	6 months

TABLE 6-1 (CONTINUED)
SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

Parameter	EPA Analytical Method	Matrix	Container[a]	Sample Volume	Preservation Measure	Holding Time[b]
Mercury	7471	soil	Stainless steel liners or glass jars	4 oz	Cool, 4°C	26 days
		water	Polyethylene or glass bottle	100 ml	HNO_3 to pH <2	26 days
TPH	8015 Modified	soil	Stainless steel liners or glass jars	4 oz	Cool, 4°C	14 days
		water	Amber glass with teflon-lined cap (diesel)	1-liter	Cool, 4°C	14 days
			Borosilicate glass 40-ml vial with teflon-lined septum (gasoline)	40-ml in duplicate	Cool, 4°C HCL to pH<2	14 days
Pesticides/ PCBs[e]	8081/8082	soil	Stainless steel liners or glass jars	4 oz	Cool, 4°C	7 days until extraction; 40 days after extraction
		water	Amber glass with teflon-lined cap	1 liter	Cool, 4°C	7 days until extraction; 40 days after extraction

Notes:
(a) The water samples to be analyzed during this investigation are only QA/QC samples. No groundwater samples will be collected.
(b) The volume of containers to be used for all other analysis will depend on the total number of parameters for which the sample in a given container is to be analyzed. This table specifies minimum values.
(c) Soils submitted for analyses are extracted within 14 days and analyzed within 40 days after extraction. Soils submitted for volatile organic compound analysis are extracted within 24 hours.
(d) 40ml vials will be filled with zero headspace.
(e) The metals and pesticides/PCBs analysis can come out of the same container as the sample volume collected for SVOCs.

6.2 ANALYTICAL PROCEDURES

The analytical procedures performed for the Parcel D investigation will include both field measurements and laboratory analyses. Because field instrumentation and analytical methodologies are continually being updated, field personnel are required to consult the equipment manual of each manufacturer for current operating procedures.

6.2.1 Field Measurements

Field personnel will record field measurements on standardized logs and will maintain field logbooks in which all data will be recorded (see Section 7.5).

The only field measurement to be made at Parcel D will be the VOC vapor analysis of sample headspace using a photoionization detector (PID). The PID is a portable, nonspecific, vapor/gas detector appropriate for a variety of organic compounds. The PID will be calibrated using isobutylene, which provides a mid-range response for most constituents of interest, is relatively safe to use, and is readily available from the supplier. The PID will be used to monitor soil cuttings during drilling operations. Cutting samples will be measured by holding the tip of the probe at the surface of the sample for 5 seconds. Response time is approximately 90 percent at 3 seconds. The measurements are reported in parts per million. All readings will be recorded in the field notebook.

6.2.2 Laboratory Analyses

The laboratory analytical methods to be used on samples collected as part of the investigation are presented in Table 6-1. Detection limits obtained during analysis will be reported for each parameter in each sample. Highly contaminated samples or samples containing interfering substances may result in elevated detection limits. Tables 6-2 through 6-6 present the detection limits for the analytical methods to be performed.

The laboratory analytical procedures that may be used for the samples collected from Parcel D are as follows:

EPA Method	Analyte
8260	VOCs
8270	SVOCs
6010	Metals
7196	Chromium (VI)
7471	Mercury
8015 Modified	TPH (diesel and gasoline)
8081/8082	Pesticides/PCBs

All work completed on a sample set will be recorded in laboratory notebooks. All analyses will be performed in accordance with the analytical laboratory's QA/QC plan and the appropriate analytical methods.

TABLE 6-2
DETECTION LIMITS FOR VOCs IN SOIL
(EPA METHOD 8260)

VOC	Detection Limit (µg/kg)	VOC	Detection Limit (µg/kg)
Benzene	2.5	Xylenes (total)	2.5
Bromodichloromethane	2.5	Dichlorodifluoromethane	2.5
Bromoform	2.5	cis-1,2-Dichloroethene	2.5
Bromomethane	2.5	2,2-Dichloropropane	2.5
Carbon disulfide	5.0	Bromochloromethane	2.5
Carbon tetrachloride	2.5	1,1-Dichloropropene	2.5
Chlorobenzene	2.5	Dibromomethane	2.5
Chlorodibromomethane	2.5	1,2-Dibromoethane	2.5
Chlorethane	2.5	1,3-Dichloropropane	2.5
2-Chloroethyl vinyl ether	5.0	Isopropylbenzene	2.5
Chloroform	2.5	1,1,2,2-Tetrachloroethane	2.5
Chloromethane	2.5	1,2,3-Trichloropropane	2.5
1,1-Dichloroethane	2.5	Bromobenzene	2.5
1,2-Dichloroethane	2.5	n-Propylbenzene	2.5
1,1-Dichloroethene	2.5	2-Chlorotoluene	2.5
Trans 1,2-Dichloroethene	2.5	1,3,5-Trimethylbenzene	2.5
1,2-Dichloropropane	2.5	4-Chlorotoluene	2.5
cis-1,3-Dichloropropene	2.5	tert-Butylbenzene	2.5
trans-1,3-Dichloropropene	2.5	1,2,4-Trimethylbenzene	2.5
Ethylbenzene	2.5	sec-Butylbenzene	2.5
Methylene chloride	5.0	4-Isopropyltoluene	2.5
Styrene	2.5	1,3-Dichlorobenzene	2.5
1,1,2,2-Tetrachloroethane	2.5	1,4-Dichlorobenzene	2.5
Tetrachloroethene	2.5	n-Butylbenzene	2.5
Toluene	2.5	1,2-Dichlorobenzene	2.5
1,1,1-Trichloroethane	2.5	1-2-Dibromo-3-CPA	5.0
1,1,2-Trichloroethane	2.5	1,2,4-Trichlorobenzene	2.5
Trichloroethene	2.5	Hexachlorobutadiene	2.5
Trichlorofluoromethane	5.0	Naphthalene	2.5
Vinyl acetate	5.0	1,2,3-Trichlorobenzene	2.5
Vinyl chloride	2.5		

TABLE 6-3
DETECTION LIMITS FOR SVOCs IN SOIL
(EPA METHOD 8270)

SVOC	Detection Limit (µg/kg)	SVOC	Detection Limit (µg/kg)
Acenaphthene	100	4,6-Dinitro-2-methylphenol	100
Acenaphthylene	100	2,4-Dinitrophenol	100
Aniline	100	2,4-Dinitrotoluene	250
Anthracene	500	2,6-Dinitrotoluene	250
Benzoic acid	100	Di-N-octyl phthalate	250
Benzo(a)anthracene	100	Fluoranthene	100
Benzo(b)fluoranthene	250	Fluorene	100
Benzo(k)fluoranthene	250	Hexachlorobenzene	100
Benzo(g,h,i)perylene	250	Hexachlorobutadiene	100
Benzo(a)pyrene	250	Hexachlorocyclopentadiene	100
Benzyl alcohol	100	Hexachloroethane	100
Bis(2-chloroethoxy)methane	100	Indeno(1,2,3-cd)pyrene	250
Bis(2-chlorothyl)ether	100	Isophorone	100
Bis(2-chloroisopropyl)ether	100	2-Metyolnaphthalene	100
Bis(2-ethylhexyl)phthalate	100	2-Methylphenol	100
4-Bromophenyl phenyl ether	100	4-methylphenol	100
Butyl benzyl phthalate	100	Naphthalene	100
4-Chloroanyline	100	2-Nitroaniline	250
2-Chloronaphthalene	100	3-Nitroaniline	250
4-Chloro-3-methylphenol	100	4-Nitroaniline	250
2-Chlorophenol	100	Nitrobenzene	100
4-Chlorophenyl ether	100	2-Nitrophenol	100
Chrysene	100	4-Nitrophenol	100
Dibenz(a,h)anthracene	100	N-Nitrosodiphenylamine	100
Dibenzofuran	100	N-Nitroso-di-n-propylamine	100
Di-N-butyl phthalate	250	N-Nitrosodimethylamine	100
1,3-Dichlorobenzene	100	Pentachlorophenol	250
1,4-Dichlorobenzene	100	Phenanthrene	100
1,2-Dichlorobenzene	100	Phenol	100
3,3-Dichlorobenzidine	100	Pyrene	100
2,4-Dichloorophenol	100	1,2,4-Trichlorobenzene	100
Diethyl phthalate	100	2,4,5-Trichlorophenol	100
2,4-Dimethylphenol	100	2,4,6-Trichlorophenol	100
Dimethyl phthalate	100		

TABLE 6-4
DETECTION LIMITS FOR METALS IN SOIL
(EPA METHODS 6010/7196/7471)

Metal	Method	Detection Limit (mg/kg)
Antimony	6010	5.0
Arsenic	6010	1.0
Barium	6010	0.1
Beryllium	6010	0.1
Cadmium	6010	0.1
Chromium (IV)	7196	0.5
Chromium (total)	6010	0.1
Cobalt	6010	0.5
Copper	6010	0.1
Cyanide	9010	0.4
Lead	6010	1.0
Mercury	7471	0.1
Molybdenum	6010	0.5
Nickel	6010	0.5
Selenium	6010	1.0
Silver	6010	0.1
Thallium	6010	5.0
Vanadium	6010	0.5
Zinc	6010	0.1

TABLE 6-5
DETECTION LIMITS FOR TPH IN SOIL
(EPA METHOD 8015 MODIFIED)

TPH	Detection Limit (mg/kg)
Diesel	8.0
Gasoline	5.0

TABLE 6-6
DETECTION LIMITS FOR PESTICIDES AND PCB IN SOIL
(EPA METHODS 8081 AND 8082)

Pesticides	Detection Limit (ug/kg)	PCB	Detection Limit (ug/kg)
Aldrin	1.0	1016	20
alpha-BHC	1.0	1221	20
beta-BHC	1.0	1232	20
gamma-BHC	2.0	1242	20
gamma-BHC (Lindane)	1.0	1248	20
Chlordane	10.0	1254	20
4,4'-DDD	2.0	1254	20
4,4'-DDE	5.0	1260	20
4,4'-DDT	1.0		
Dieldrin	2.0		
Endosulfan I	1.0		
Endosulfan II	2.0		
Endosulfan sulfate	10.		
Endrin	2.0		
Endrin aldehyde	2.0		
Heptachlor	1.0		
Heptachlor epoxide	1.0		
Methoxychlor	30		
Toxaphene	35		

7. SAMPLE HANDLING AND CUSTODY

Sample custody and control procedures have been designed in accordance with EPA requirements. To establish the documentation required to trace sample possession from the time of collection to the time of analysis, a chain-of-custody form will be completed and will accompany every sample during transportation to the designated analytical laboratory.

The chain-of-custody form will include the following information:

- Project name and location
- Project number
- Sample identification
- Date and time when the samples were collected
- Sample type
- Container type
- Sample preservation measures
- Analyses requested and analytical level
- Total samples shipped
- Signature of the sample collector
- Date when the samples were relinquished
- Signatures of the persons involved in the chain of possession

7.1 FIELD CUSTODY PROCEDURES

The following chain-of-custody procedures will be implemented to maintain and document the possession of samples:

1. Samples will be collected as described in this SAP.
2. The Field Operations Manager is personally responsible for the care and custody of the samples collected until they are properly transferred or dispatched to the analytical laboratory.
3. Labels will be completed for each sample, using waterproof ink.
4. If a label is lost during shipment (or if one was never prepared), a written statement will be prepared detailing how the sample was collected and transferred to the laboratory. The statement will include all pertinent information, such as entries in field log books regarding the sample and whether the sample was in the collector's physical possession or in a locked compartment until hand-transported to the laboratory.

7.2 TRANSFER OF CUSTODY AND SHIPMENT

The following procedures will be implemented when transferring custody of samples:

1. Samples will be accompanied by a chain-of-custody form. This form documents custody transfers from the sampler to the analyst in the laboratory. When transferring possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the form.
2. Samples will be packaged properly for shipment and dispatched to the laboratory for analysis; a separate custody form will accompany each shipment (e.g., one custody form per sample cooler) and will identify its contents. Shipping containers will be sealed for

shipment. The method of shipment, name of courier(s), and other pertinent information will be entered in the "Special Instructions" section of the custody form.

3. The original chain-of-custody form will accompany the shipment; a copy will be retained by the Field Operations Manager for the project record. The original form will be placed inside the shipping container which will then be sealed. The courier will not be required to sign the form, since the container will be sealed.

4. If sent by mail, the package will be registered with a return-receipt request. If sent by common courier or air freight, proper documentation must be maintained (e.g., the bill of lading).

7.3 LABORATORY CUSTODY PROCEDURES

The following procedures will be implemented when the samples arrive at the laboratory:

1. A designated custodian will take custody of all samples upon their arrival at the laboratory. If delivered to the laboratory after duty hours or when the custodian is not present, the samples will be placed in a designated holding area in accordance with the procedures established by the laboratory.

2. The custodian will inspect the custody seals to make sure they are intact and the labels and chain-of-custody forms to make sure they correspond one to one and are complete.

3. The custodian will then assign a unique laboratory number to each sample and, as necessary, transfer the samples to secured storage areas maintained at 4°C. The laboratory sample number must be traceable back to the field sample identification number and will be used to identify the sample during storage, analysis, data reduction, data validation, and reporting.

4. The custodian will enter the label data into the laboratory's sample-tracking system. This system will be used to ensure that all samples are transferred to the proper analyst or stored in the appropriate secure area.

7.4 SAMPLE PACKAGING AND SHIPPING

7.4.1 Sample Packaging

Samples will be packaged according to the following procedures:

1. The custody seal will be wrapped around the end of each container and signed and dated by the sampler.
2. Glass sample containers will be wrapped with plastic insulating material to prevent contact with other sample containers or the inner wall of the cooler.

7.4.2 Shipping Containers

Samples will be packaged in rigid, thermally insulated coolers that contain ice (triple-bagged in plastic) or Blue Ice and absorbent packing for liquids or foam packing for solids. The completed chain-of-custody form will be placed inside the shipping container, unless otherwise noted. The container will be secured with strapping tape to prevent opening during shipment.

7.4.3 Marking and Labeling

The cooler will be marked as follows:

- Proper shipping name, i.e., "Liquid Environmental Samples" or "Solid Environmental Samples."
- Class, i.e., "This Side Up" or arrows placed on opposite sides of the outer container if shipping liquid.

Two strips of custody tape will be placed on each cooler, one strip on the front and one on the back, located in a manner that would indicate whether tampering had occurred.

7.5 Field Logs

Daily logs will be maintained on site by the Field Operations Manager to provide a daily record of significant events, observations, and measurements during field operations. The daily logs will be maintained in a bound field notebook. All entries will be made legibly in indelible ink, signed, and dated. Field notebooks are intended to provide sufficient data and observations to enable participants to reconstruct the events of the project investigation. The field notebook entries must be factual, detailed, and objective. Information to be recorded in the field notebook shall include, but is not limited to, the following:

- Date, time, and place of sampling
- Information on field QC samples, as applicable
- Weather conditions at the time of sampling, including ambient temperature and approximate wind direction and speed
- Data from field analyses (pH, air sampling, etc.)
- Observations about the site and samples (odors, appearance, etc.)
- Information about any extraneous activities that may affect the integrity of the samples (e.g., emissions from nearby operations)
- Analyses and required preservation techniques
- Temperature readings of the sample cooler

7.5.1 Corrections to Documentation

Unless restricted by weather conditions, all original data recorded in field notebooks, sample identification tags, and chain-of-custody forms will be written in waterproof ink. The chain-of-custody forms are accountable, serialized documents and are not to be destroyed, even if they are illegible or contain inaccuracies that require replacement documentation.

An error discovered on an accountable document will be corrected by the person who made the entry. Corrections are made by crossing out the error with a single line and entering the correct information. The erroneous information should not be obliterated. All corrections will be initialed and dated.

7.5.2 Disposition of Documentation

Upon conclusion of the field effort at Parcel D, field documentation (maps, well logs, logbooks, etc.) will be clearly labeled and placed in the project files.

7.6 LABORATORY FILES

Laboratory files will be maintained for each project for at least five years. The file will contain all data and reports, including raw data calculation sheets, chromatograms, and mass spectrums, and all written and computerized records of laboratory handling and analysis. Specific storage and formatting requirements for laboratory data will be specified by Integrated Environmental Services, Inc. and provided to the laboratory contracted to analyze the samples collected during the Parcel D soil sampling program.

8. References

Integrated Environmental Services, Inc. (IESI) 1997. *Health-Based Remediation Goals for Surface Soils, Douglas Aircraft Company C-6 Facility, Parcel A, Torrance, California.* Prepared for McDonnell Douglas Realty Company. August.

Integrated Environmental Services, Inc. (IESI) 1999a. Memorandum from Anderson Cheng to Joann P. Ornelas re: Inspection of Buildings 59 and 59A and the Storage Yard in Parcel D. April 27.

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Kennedy/Jenks Consultants (K/J) 1996a. *Phase I Environmental Assessment, Parcel A.* Prepared for McDonnell Douglas Realty Company, March.

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